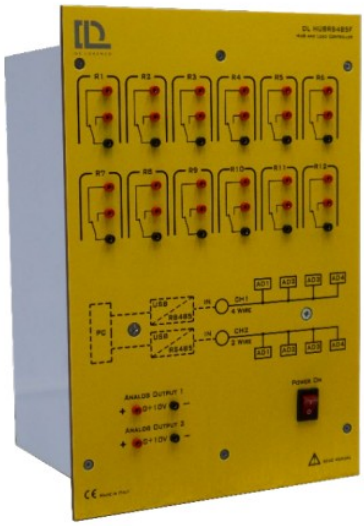

HUB di comunicazione Modbus e controllore di carico

Modulo RS485 HUB che permette il collegamento seriale dei moduli di misura e degli attuatori del laboratorio per la comunicazione e il controllo tramite PC.

Include:

- 1 bus di comunicazione RS485 a 4 fili con un ingresso RS485 e quattro uscite RS485.
- 1 bus di comunicazione RS485 a 2 fili con un ingresso RS485 e quattro uscite RS485.
- 2 uscite analogiche: 0 ÷ 10V, controllabili tramite Modbus RTU.
- Dodici uscite a relè: 1NO/1NC, controllabili tramite Modbus RTU.
- Un interruttore di on/off.
- Alimentazione: 100-240 Vac 50/60Hz.

Modbus communication HUB and load controller

RS485 HUB module that allows the serial connection of the measurement modules and actuators of the laboratory for communication and control via PC.

It includes:

- 1 RS485 4 Wire communication bus with one RS485 input and four RS485 outputs.
- 1 RS485 2 Wire communication bus with one RS485 input and four RS485 outputs.
- 2 Analog outputs: 0 ÷ 10V, controllable via Modbus RTU.
- 12 relay outputs: 1NO/1NC, controllable via Modbus RTU.
- One switch for power on/off.
- Power supply: 100-240 Vac 50/60Hz.

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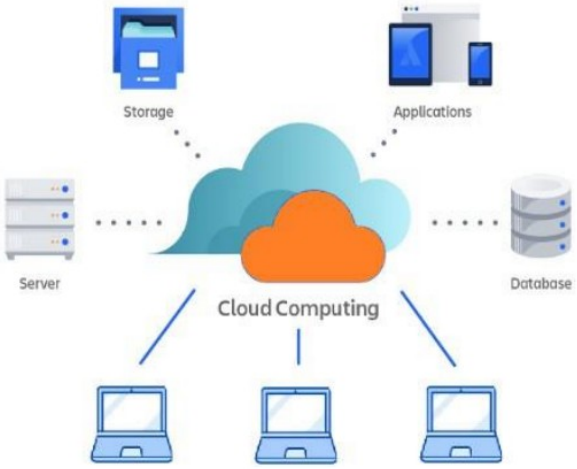
NEXT GENERATION LABS

The Cloud Computing paradigm is gaining more and more ground in corporate IT innovation, as it allows renting processing resources "on demand", without the need to manage the necessary machines (servers) on site, reducing maintenance costs (breakage of hardware components, addition of processing resources such as CPU, RAM or mass memory) and allowing a use of resources suited to the application they must support.

Further advantages are the possibility of increasing resources the instant they are needed (e.g., due to a sudden increase in the workload generated by a traffic burst) and being able to reduce them the instant they are no longer needed, ensuring cost savings.

This "abstraction" of cloud computing also makes it possible not to have to keep the physical machines directly on site, reducing the times in which the application is offline due to failures of the infrastructure or of the machines themselves.



The Module allows configuring and using a private Cloud Computing system within the Laboratory.

It consists of a Server equipped with all the necessary software components:

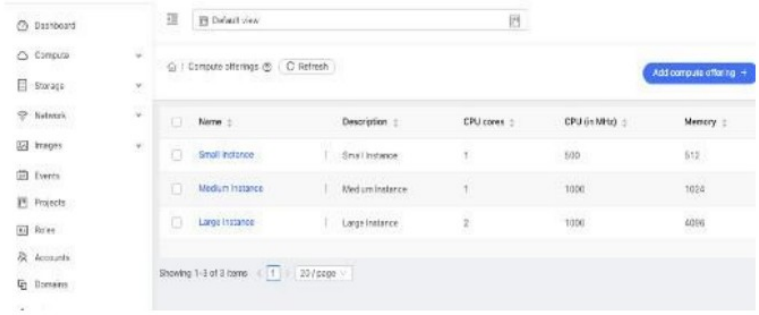
- Preconfigured physical server
- Physical hardware
- Ubuntu Operating System
- Apache CloudStack cloud computing platform and its software requirements
- Open Office, MySQL Database

The resources of this server can be accessed autonomously from the laboratory workstations, using a browser (e.g., Google Chrome) to connect to the Apache CloudStack web interface.

There is also a command prompt with SSH connection capability: Putty for Windows environment.

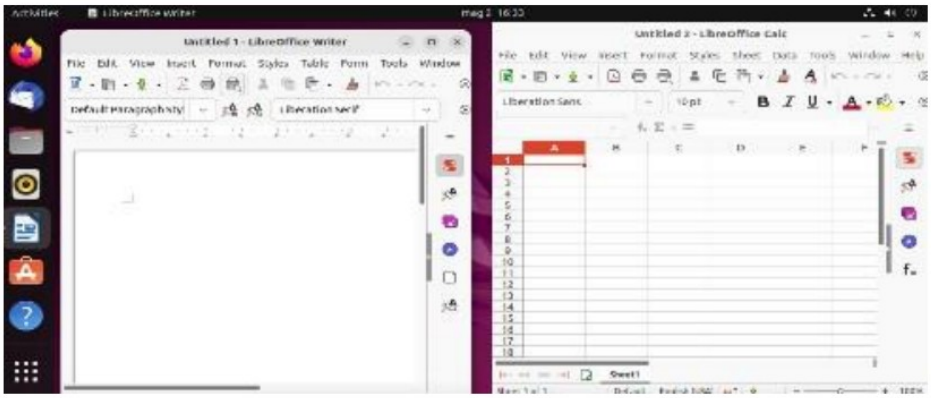
This solution of implementing a physical Server inside the Laboratory, instead of using Servers available online on the Internet with their Cloud Computing services, certainly has positive aspects both in terms of

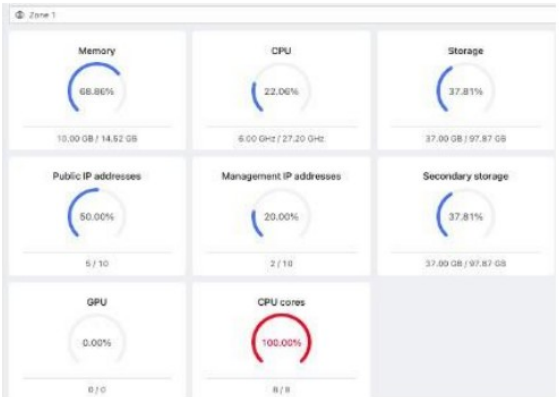
CloudStack allows configuring Virtual Machines, which reside on the Server, but which are used by Remote Users. For each machine you can set resources such as: number of cores, memory, disk space, etc.



The activity of all Virtual Machines is controlled on the server, in real time, using the appropriate CloudStack tools.

Once users of the system have connected to one of the Virtual Machines, they can work on them as if they were computers on their workstation. It works with the Ubuntu Operating System and with all its individual productivity tools: Editor, Spreadsheet, database, etc.


Activities
LibreOffice Writer
Untitled 1 - LibreOffice Writer
File Edit View Insert Format Styles Table Form Tools Window
Default Paragraph Style
Liberation Serif
Untitled 2 - LibreOffice Calc
File Edit View Insert Format Styles Sheet Data Tools Window Help
Liberation Sans
10 pt
Sheet1



Educational experience

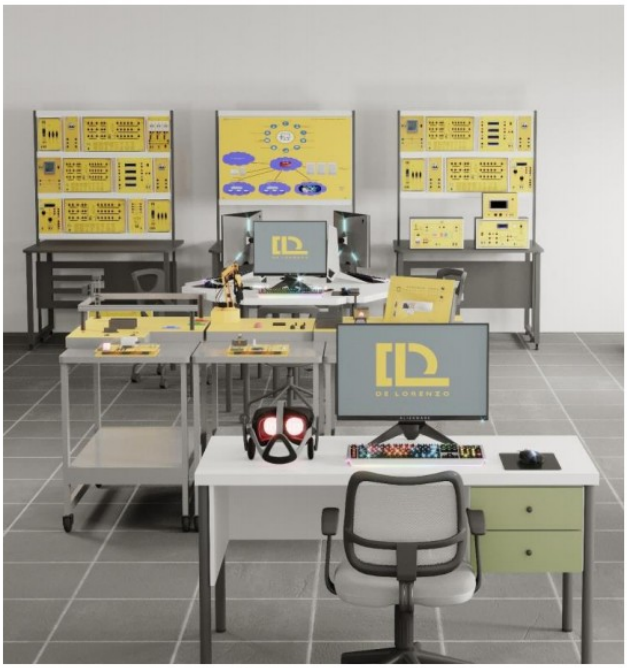
- Introduction to Cloud Computing
- Types: IaaS, PaaS, SaaS, XaaS
- Cloud Services
- Storage, security, analysis services
- Setting up virtual machines
- Using virtual machines
- Examples and applications

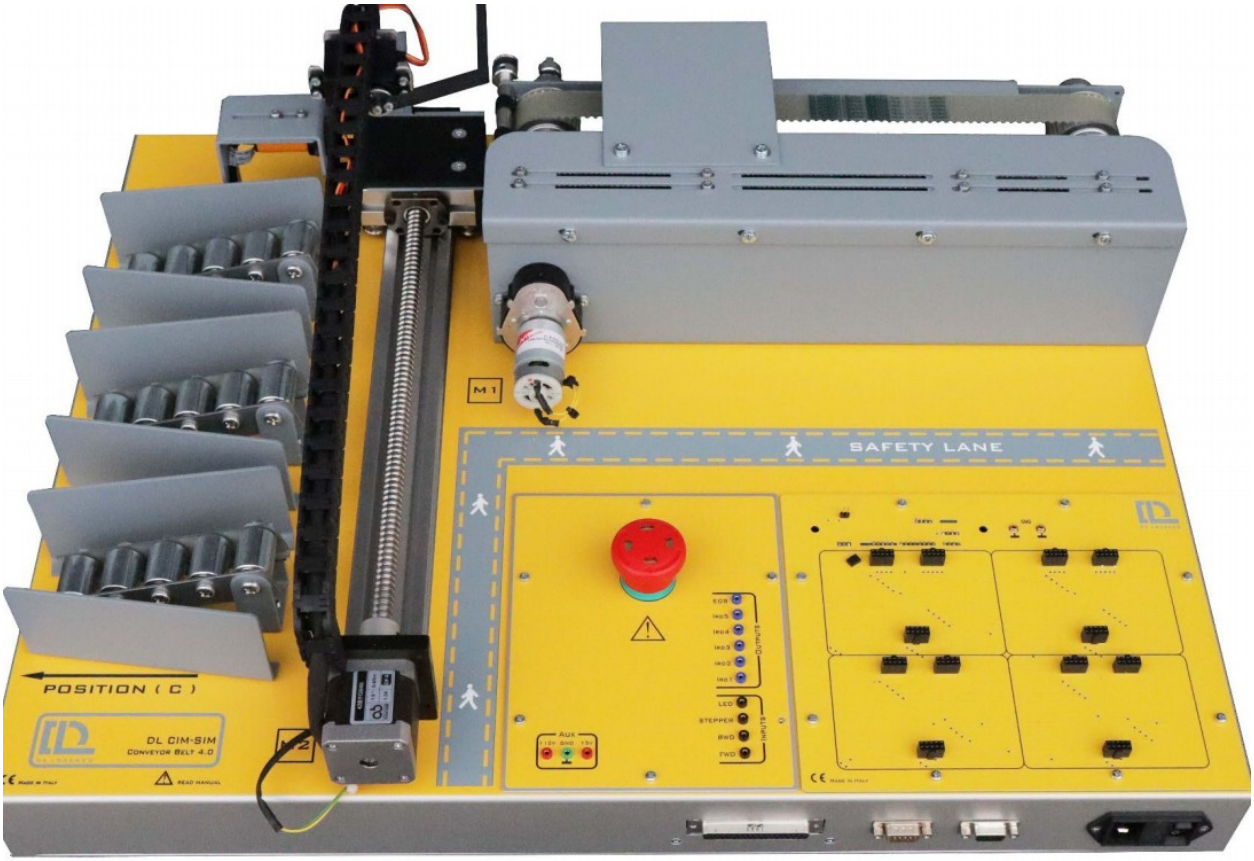
NEXT GENERATION LABS

The DL NGL-CLOUD module can be integrated in the NEXT GENERATION LAB - DL NGL laboratory through the minimum purchase of the following modules:

- **Teacher Station - DL NGL-BASE**
  Necessary for the proper functioning of the laboratory. Quantity: 1.

- **Student Station - DL NGL-STUDENT**
  To be multiplied by the number of "student stations" to be created.





DL NGL-CIMSIM

Module for the study of a conveyor belt

Description of the System:

KIT OF BOARDS

EDUCATIONAL EXPERIENCES

Kit composed of sub-boards for the preparatory study of the different elements that make up a system of conveyor belts. The sub-boards can interact with each other through a dedicated motherboard, allowing the student to perform interactive practices on different topics related to automation such as:

- Control of an LCD display via a microcontroller.
- Detection of an object using an infrared sensor.
- Monitoring of an RGB sensor.
- Control of a DC motor through a power driver.
- Control of a stepper motor.
- Action control and interlock function via a push button pad.
- Writing on a seven-segment display.

CIRCUIT BLOCKS

- Motherboard
- LCD display sub-board
- DC motor driver sub-board
- DC motor sub-board
- Inputs sub-board
- Seven-segment display sub-board
- Stepper motor with driver sub-board
- IRD sensor sub-board
- RGB sensor sub-board
- Microcontroller sub-board

HARDWARE SIMULATOR

EDUCATIONAL EXPERIENCE

This system is mainly used to teach, demonstrate and experiment with different methods of controlling a conveyor belt.

The student will improve the skills necessary for the HW designing and SW programming of an electromechanical system.

A real PLC (supplied with the trainer) controls the sequential operation of the system, as in real automated processes, allowing the development, implementation and optimization of an application in the industrial field:

- Control of a conveyor belt through a pushbutton panel.
- Use of a PLC to control the movement of the conveyor belt.
- Monitoring and identification of a processed part on the conveyor belt.
- Tracking of the position of a part placed on the conveyor belt.
- Identification and check of the color of a part.
- Identification of a defective part and placing it in the correct position at the end of the line.

The system interfaces with the SCADA software for monitoring and control.

TECHNICAL CHARACTERISTICS

- Power supply: 90V-230V ±10%, 50/60Hz
- DC motor that drives the belt:
  - Speed: 10 rpm
  - Rated voltage: 12 Vdc
- Linear actuator of the stepper motor:
  - Rated voltage: 12 Vdc
- Servo motor:
  - Rated voltage: 5 Vdc
- Control panel:
  - Motor drivers
  - Inputs and outputs of sensors and actuators accessible via 2 mm connectors.
  - Slot for inserting the system boards.
  - Compatible with Arduino UNO boards:
    - ATMEGA328 processor
    - 32KB flash memory
    - 1KB EEPROM memory
    - 2KB SRAM memory
    - 23 generic I/O ports
- IR position sensor
- RGB sensor
- RFID detector

ACCESSORY INCLUDED:

DL 2110AM

Programmable Logic Controller 12/10
Type of module: frame or bench type
PLC inputs:

- 8 digital inputs
- 4 digital/analogue inputs

PLC outputs:

- 8 relay outputs
- 2 analogue outputs (V / I selectable outputs)

Two 0-10 V outputs are adjustable through potentiometer.
12 digital level switches
8 LED for the visualization of the output states
Output in 24 V_{DC} fixed voltage
Programmable via USB port
Communication: Modbus RTU RS485

NECESSARY ACCESSORY:

DL 2555ALG

DC power supply

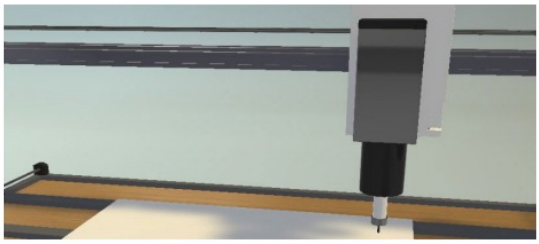
- ± 5 Vdc, 1 A
- ±15 Vdc, 1 A

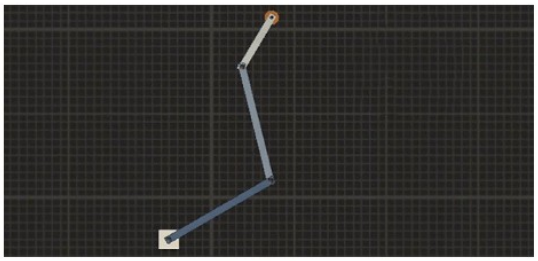
Artificial intelligence is a discipline that studies whether and how intelligent computer systems capable of simulating the ability and behaviour of human thought can be created.

It belongs to computer science, which studies the theoretical foundations, methodologies and techniques that allow the design of hardware and software systems capable of providing the computer with performances that would appear to be the exclusive pertinence of human intelligence.

The 'Artificial Intelligence' Module adds to the Basic Module the tools for studying and learning about topics related to AI.

It is composed of a software that has been developed to teach artificial intelligence clearly and effectively. With this software, students can enhance their individual experience in the practical study of this new discipline.

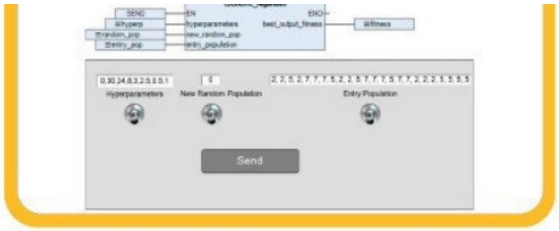




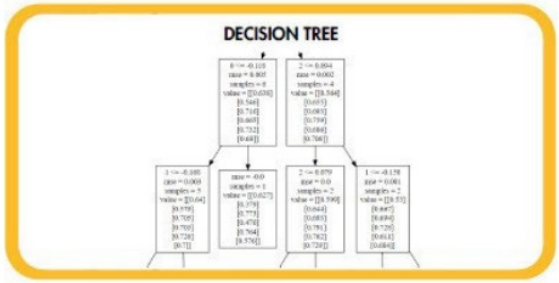
Teachers can offer students experiments on the following topics:

- Optimization: Using the genetic algorithm to solve optimization problems, such as the time problem or the cost problem.
- Classification: Using neural networks to solve classification problems.
- Reinforcement Learning: Using reinforcement learning to train a robot to reach a specific location.
- Regression: Comparing the performance of decision tree and neural network algorithms in system modelling and predictions.

e software contains simulations of industrial vironments in 3D and includes integrated jects with activities, instructions, contents d automatic validation.



projects have well-defined goals. They are ıctured in activities and each activity has cific requirements and provides students h instruction, content and guidance.



e software itself checks the student's solution each activity in real time and allows him to ve on to the next activity.

works integrated with an IDE (Integrated velopment Environment, i.e., a software that, the programming phase, supports grammers in the development and bugging of the source code of a program) hon.

KT GENERATION LABS

e DL NGL-AI module can be integrated the NEXT GENERATION LAB - DL NGL oratory through the minimum purchase he following modules:

Teacher Station - DL NGL-BASE
Necessary for the proper functioning of the laboratory. Quantity: 1.

Student Station - DL NGL-STUDENT
To be multiplied by the number of "student stations" to be created.

Didactic simulators for IoT

The MiniSims are small simulators designed for educational use in the study of Internet of Things (IoT) technology and its applications in various sectors, such as: Agri-food, energy, automotive, manufacturing, etc. computer, health, chemical and biotechnological.

They simulate, through an internal microcontroller, the operation of a computer, a plant, a system, etc., interacting with the student and generating all the information for the connection to the IoT, thus allowing to achieve one of the main objectives of this technology, what is to be seen or controlled by both other objects and network users.
A real IoT system is composed of objects (equipment, plants, systems, etc.), communication networks, servers and clients. An important feature of the MiniSims is to reproduce the entire IoT system on a single workstation, in an 'open' way, where the student can interact autonomously with the different parts of the system.

To use the MiniSims you need the IoT module, in particular, the DevIoT unit for the physical connection of the simulator to the cloud and the DL Workspace application that contains the servers and clients for the full operation of the system.
Experiments can be performed on a single computer, using all the tools of the DL Workspace software

The simulators are connected to the DevIoT unit that sends the information from the simulators to a cloud server. All cloud components are present on the PC.
A LAN connection is used between the DevIoT unit and the PC, in which the MQTT server of the DL Workspace is activated, which receives all the information from the simulators and saves it in a database.
The DL Workspace HTTP server is then used to provide database information to a "remote" user via a web in-terface. On a PC (or on any mobile device) simply using a browser and opening the HTTP server web page with real-time updated information about the state of the simulated plants.

The simulators available are as follows:

- DL MiniSim-ENE1: Domestic photovoltaic system with remote monitoring of operating parameters.
- DL MiniSim-CAR1: Connected car, remote monitoring and diagnosis.
- DL MiniSim-MAN1: Simulation and control of an intelligent factory.
- DL MiniSim-BIO1: Telemedicine, electrocardiogram with remote viewing.
- DL MiniSim-AGR1: Agri-food 4.0 in greenhouses.
- DL MiniSim-CHI1: Chemistry 4.0, remote monitoring of a chemical plant.

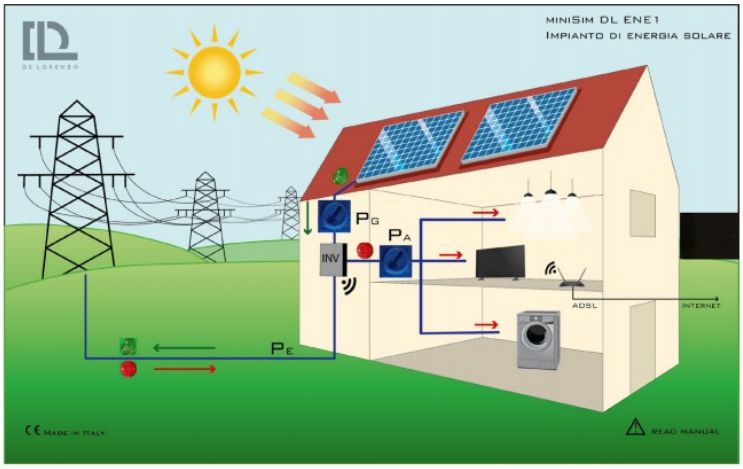
operating parameters

Electric power production systems using photovoltaic panels are increasingly used in the home.

Currently, most of them allow to monitor the system remotely using a PC or a mobile phone using IoT techniques.

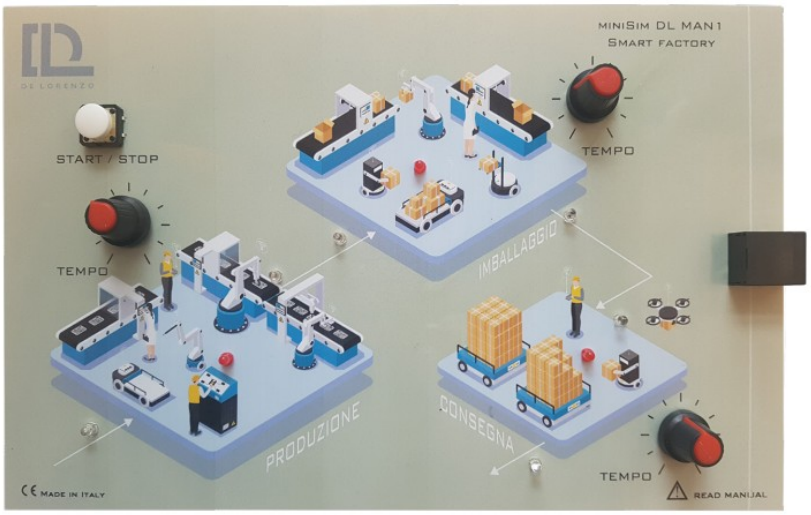
The control unit present in the house that uses a domestic connection to the internet sends the production and consumption data via the IoT protocol to a server installed anywhere in the world.

From anywhere else in the world, you can connect to this server and view the data using a simple web interface and HTTP protocol.



The simulator of the DL MiniSim-ENE1 solar system is used, which shows a screen print of the components of the domestic system, and allows to vary, through the potentiometer, the energy produced by the solar panels (to simulate different environmental conditions) and the energy absorbed by the domestic charges. The power absorbed or sent to the network operator is calculated with a subtraction.

three workstations (Slaves) and thus coordinates their operation.
In an intelligent factory that uses Internet of Things techniques, the 3 workstations are objects (things) that communicate their status to a server and receive information from the server relative to the status of the other stations, that is, they exchange the status between them.
Station 1 will inform when it is free to accept incoming materials, Station 2 will indicate that production is working, and Station 3 will give the availability of the outgoing product. In this way, each station is able to operate in coordination with the others without the need for superior control logic.



The DL MiniSim-MAN1 is used, which shows a screen print of the components of the complete system and shows the status of the different workstations through multi-colored LEDs.

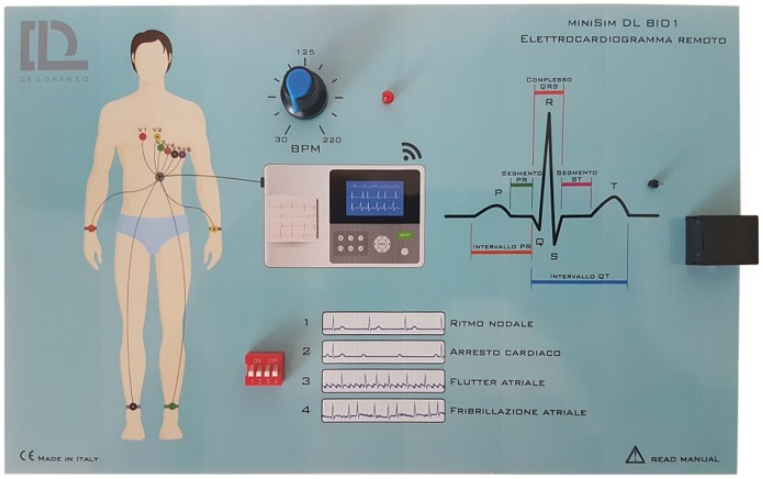
DL MiniSim-BIO1
Telemedicine, Electrocardiogram with Remote Display

Telemedicine is defined as a way of providing health services using innovative technologies, in particular Information and Communication Technologies (ICT), in situations where the healthcare professional and the patient (or two professionals) are not in the same place. Telemedicine involves the secure transmission of medical information and data in the form of texts, sounds, images or other forms necessary for the prevention, diagnosis, treatment and subsequent follow-up of patients.

Telemedicine services can be used with any diagnostic or therapy health service.
However, the provision of telemedicine does not replace the traditional provision of health care in the doctor-patient relationship, but complements it to potentially improve effectiveness, efficiency and adequacy.

The simulator shows a 'real' system in which a patient performs an electrocardiogram, and the doctor controls it in real time remotely.
On the DL MiniSim-BIO1, the ECG signal is generated continuously. A potentiometer allows you to vary the rate from 30 to 220 beats per minute.

It is possible to generate different types of ECGs (the waveform is generated by the microcontroller within the panel) and a dip switch on the panel allows you to select different ECGs with different pathologies.

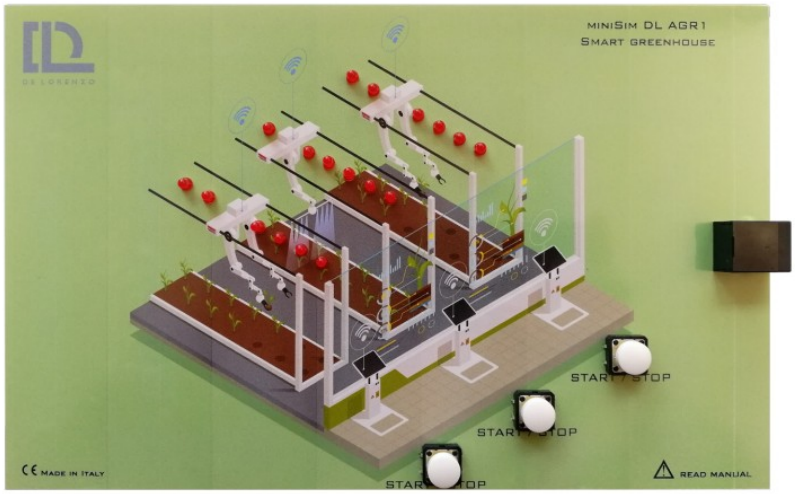


The DL MiniSim-BIO1 is used, which displays a screen print of the entire system components and generates a simulated voltage ECG signal.

Food Agriculture 4.0 in greenhouses

Food agriculture 4.0 aims to integrate digital technologies and agricultural production to achieve a reduction in energy consumption and resources used in the greenhouse and in the field.
Information technology, which allows remote monitoring of the environment and plants, can ensure favorable environmental conditions for the crop, leading to the objective of increasing the productivity and health of crops, also reducing the use of agrochemicals. In particular, Internet of Things (IoT) technologies together with new intelligent algorithms allow monitoring plant health remotely and coordinating phytosanitary and greenhouse energy management in an integrated manner, in order to optimize crop health and energy consumption.

The information derived from environmental, energy and agricultural monitoring exploits the transmission on the Internet, to be processed remotely from any point thanks to the development of new intelligent algorithms in order to visualize and implement control strategies.
The simulator shows a "real" 4.0 greenhouse system, with an automatic irrigation system, sensors to monitor the weather conditions and actuators to adjust the conditions themselves.



The DL MiniSim-AGR1 which shows a screen print of the components of the complete system, also contains:

- A LED bar showing the position of the irrigation cart.
- A cart start/stop switch.
- The following DevIoT unit resources are also used:
- The actual temperature sensor with PT100 probe.
- The real DC motor for a simple remote temperature control.

It is possible to observe in real time the position of the irrigation cart and the temperature value and start or stop the irrigation cart and the fan motor.

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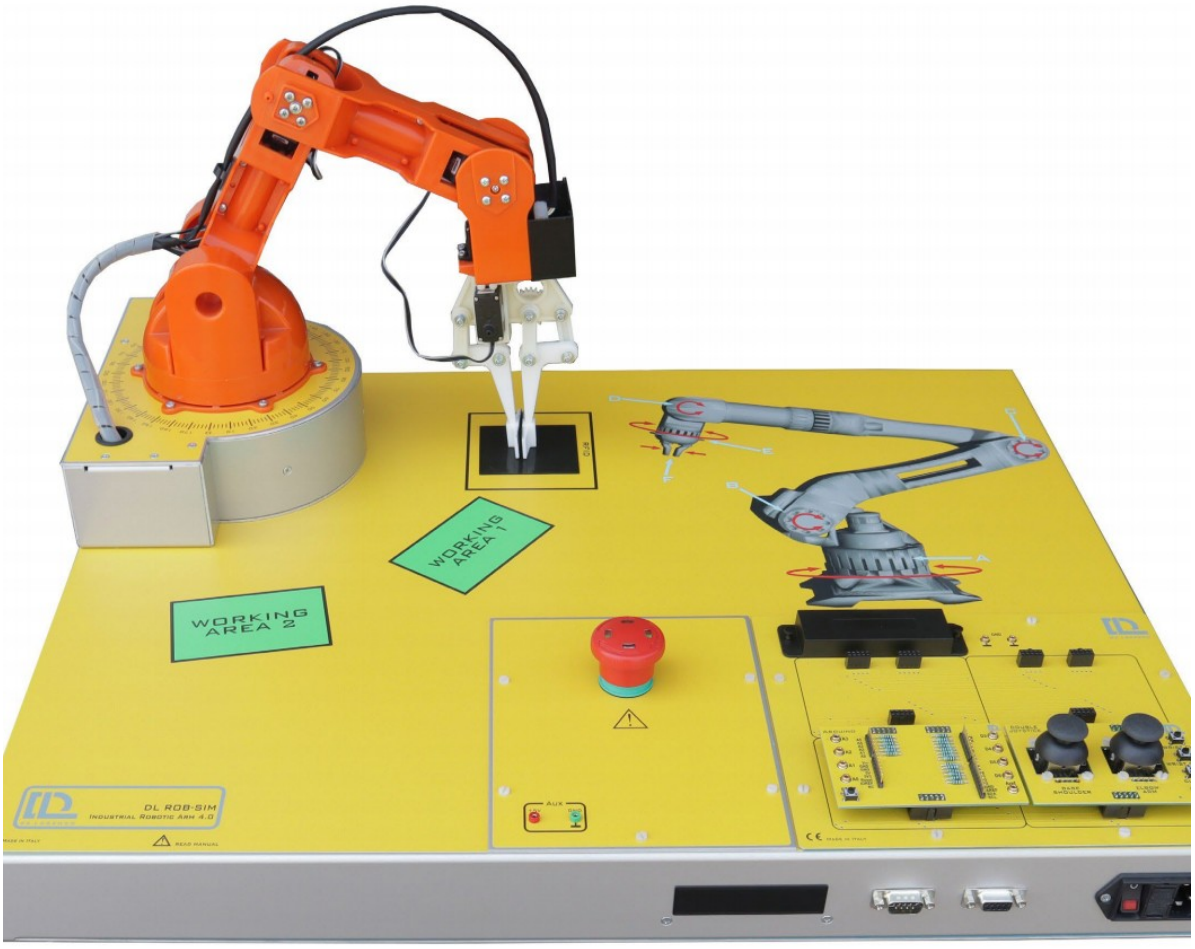
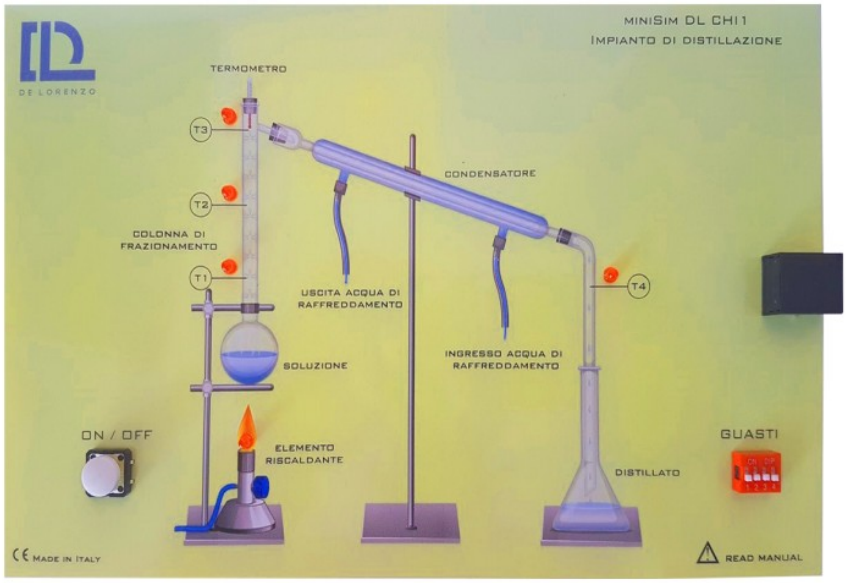
NEXT GENERATION LABS



DL NGL-ROBSIM

Module for the study of 5-axis robotic arm

The simulator shows a 'real' Industrial Distillation Chemical Plant, in its various components make it controllable and manageable remotely through IoT technologies.



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DL NGL
NEXT GENERATION LABS

Laboratory for the digital professions of the future

DL NGL LAB

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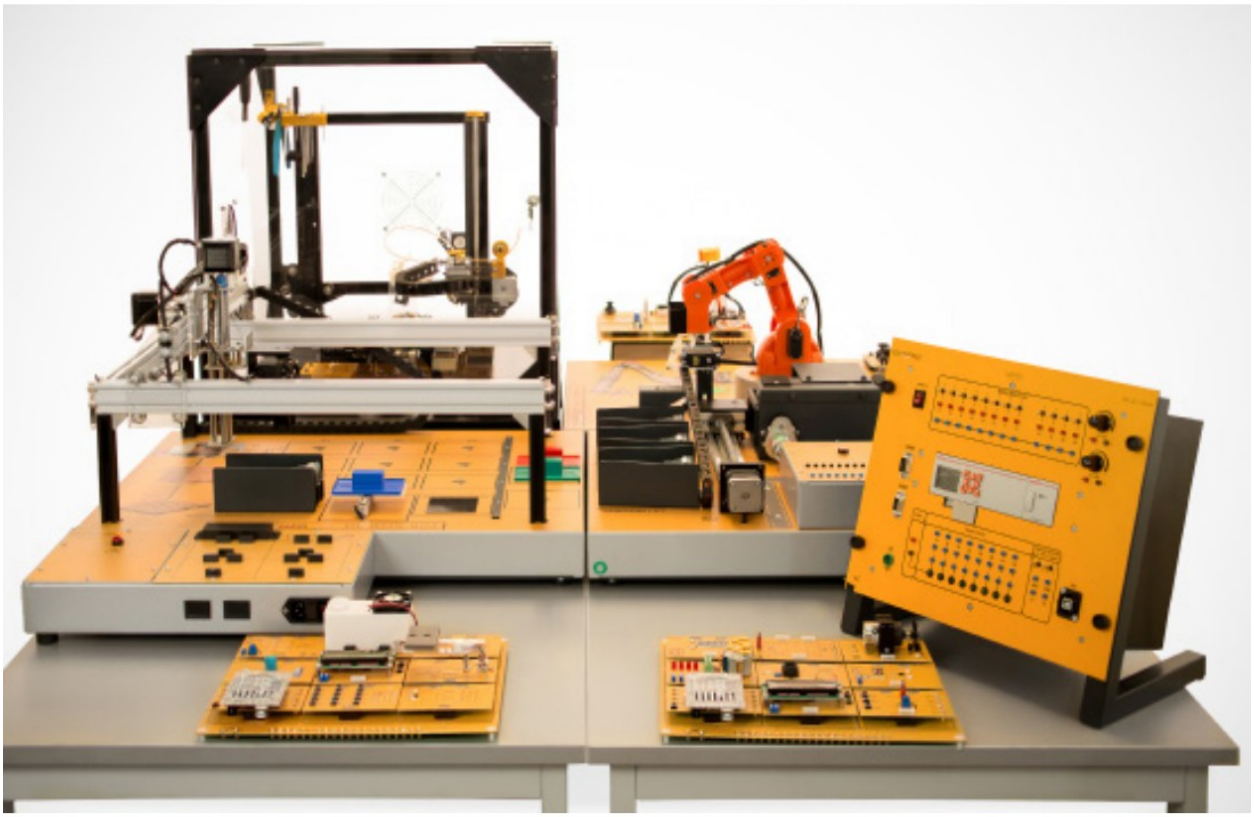
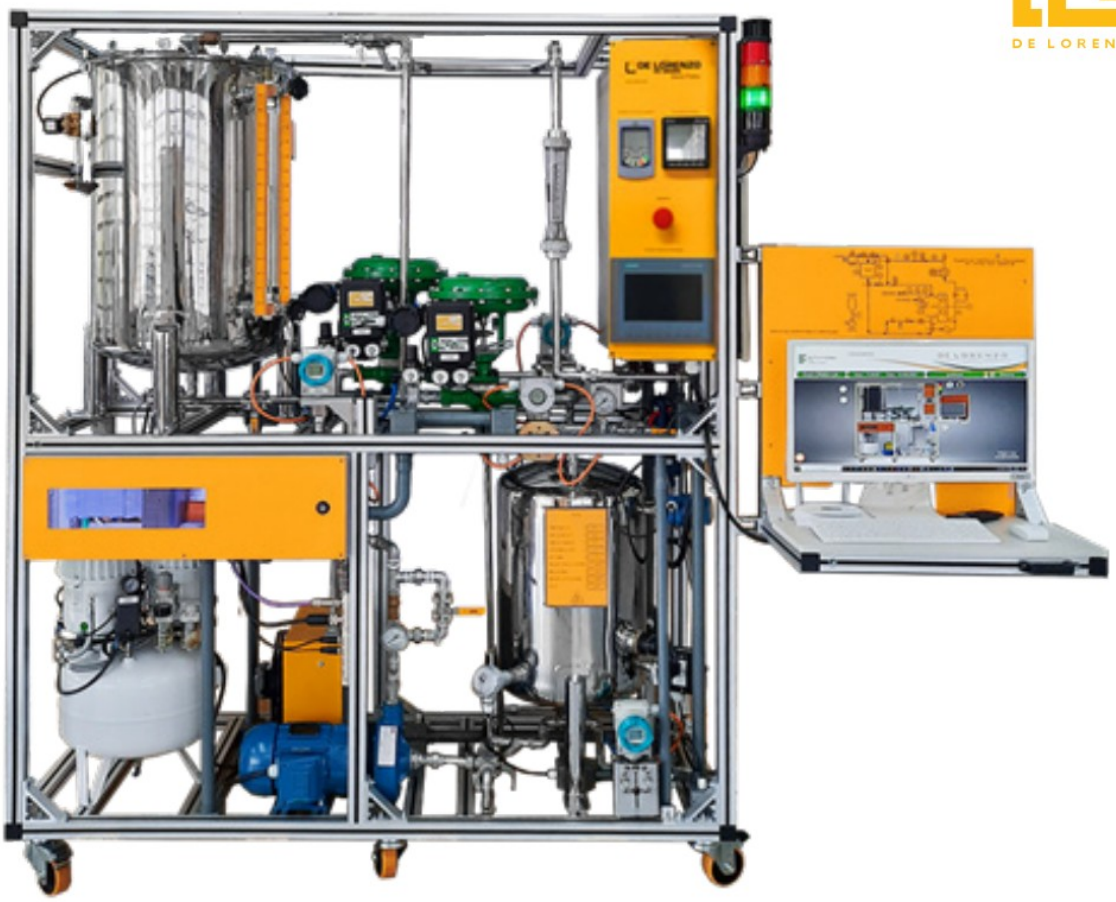
Digitalization in the industry

Digitalization is spreading in many areas, bringing new value in terms of efficiency, competitiveness, sustainability and showing ample room for growth. In terms of digital innovation in the industry, new digital technologies (Artificial Intelligence, Robotics, Internet of Things, Cloud, etc.) have brought great advances in the automation of production processes.
In the so-called "intelligent manufacturing", the presence of autonomous machines equipped with artificial intelligence assigned to the heaviest and most repetitive jobs, the connectivity and dialog between different devices and the centrality of the data, its collection, its analysis, and its use to make decisions, they bring to life a more efficient, safe, and competitive production site.

First, we talk about industrial robotics, one of the technologies most intuitively associated with intelligent manufacturing, and the automation of work, both in the productive sector and for some activities related to administrative work, capable of performing simple tasks such as information and data extraction, transmission and execution.

However, the ability of machines to communicate with each other by exchanging information through Internet of Things (IoT) technology and advanced sensors, with applications related to the monitoring of production flows, quality control and predictive maintenance of machinery is paramount.





Artificial intelligence techniques are also innovative, supporting numerous processes and multiple operations at companies.

Artificial intelligence techniques are also innovative, supporting numerous processes and multiple operations at companies.

The large amount of data collected by sensors of the machinery, as well as those generated by other devices present on the production site, must be analysed to extract values and make decisions accordingly, for example, in areas such as product development, marketing actions, the whole management area (logistics, customers and process optimization) and forecasting activities such as predictive maintenance and failure prediction. In this case, Big Data technology is key.
When it comes to the cloud, the entire manufacturing industry has learned how to use it to improve the efficiency of the entire production cycle. The ability to use cloud computing and storage services simplifies the digital processes of all companies.

Finally, other technologies also contribute to supporting intelligent manufacturing, including those based on 5G, additive manufacturing and 3D printing, virtual and augmented reality.

DIDACTIC EXPERIENCE

The laboratory has been designed to reconstruct internally, through devices, equipment and systems, hardware and software, the reality in which these new professions are being developed, in order to create real experiences on equipment, instruments and processes, as if the students were operating in a real-life job.
The laboratory aims to develop courses and skills in many technological areas.

ASSOCIATED COURSES

1. **Robotics and automation**
2. **Artificial Intelligence**
3. **Cloud computing**
4. **Cybersecurity**
5. **Internet of Things**
6. **Smart Greenhouse**
7. **Manufacture, modelling, and 3D printing**
8. **Virtual and augmented reality**
9. **Big data**
10. **Blockchain**
11. **E-commerce**
12. **Industry 4.0**

With applications in numerous economic sectors, such as: Agri-food, automotive, ICT, construction, energy, financial services, manufacturing, chemistry and biotechnology, transportation and logistics, green transition, public administration, health, professional services, tourism, and culture..

System feature

The laboratory has a modular structure that allows it to adapt to the different realities and needs of schools.

It consists of a **base module**, which contains the devices and tools to implement the Internet network and all its features, with **workstations for teachers and students,** and **thematic modules**, consisting of devices and / or application software, to achieve the objectives of developing specific competences in different sectors.

WORKSTATIONS

DL NGL-BASE: Teacher Station

Teacher Station

Composed of:

- Base module containing all network devices, with a block diagram illustrating the structure of the entire system, to implement the Internet network in which teachers and students work as if they were operating in real external reality.
- Windows PC with DL Workspace software.

DL NGL-STUDENT: Student station

Composed of:

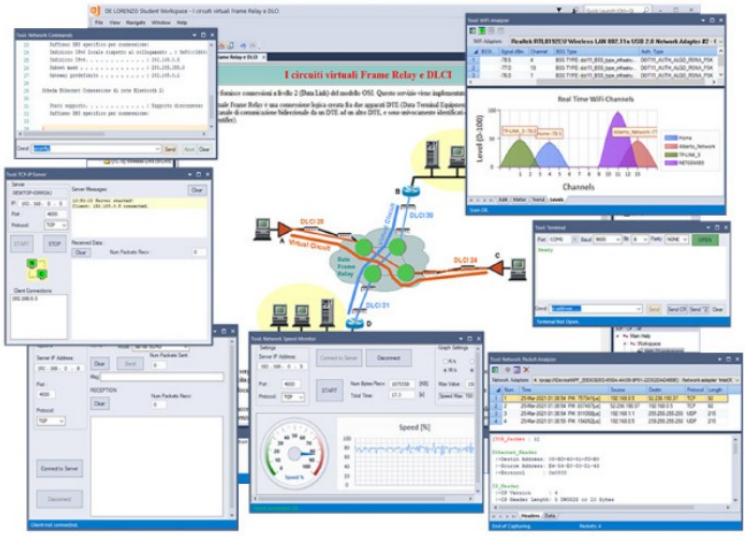
- Windows PC with DL Workspace software,

Students can work individually or in groups. Student stations are all connected to each other and to the teacher's station via the Internet.

At the hardware device level, 2 student networks have been created to halve the workload, as student stations connect via WiFi, but within the lab, it is possible to create workgroups among students without limitations.

The number of student stations is free. The school can decide how many stations to install in the lab.

DL WORKSPACE

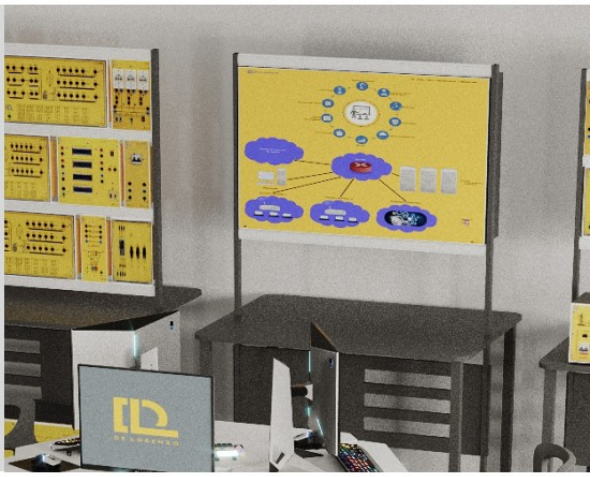


DL WORKSPACE software provides an integrated work environment in which all the tools for study and experimentation are placed, allowing you to:

- access the didactic material in PDF format.
- manage answers to lesson questions.
- perform experiments with Toolbox (Server, Client, Protocol Analyser, Wifi Analyser, etc.).

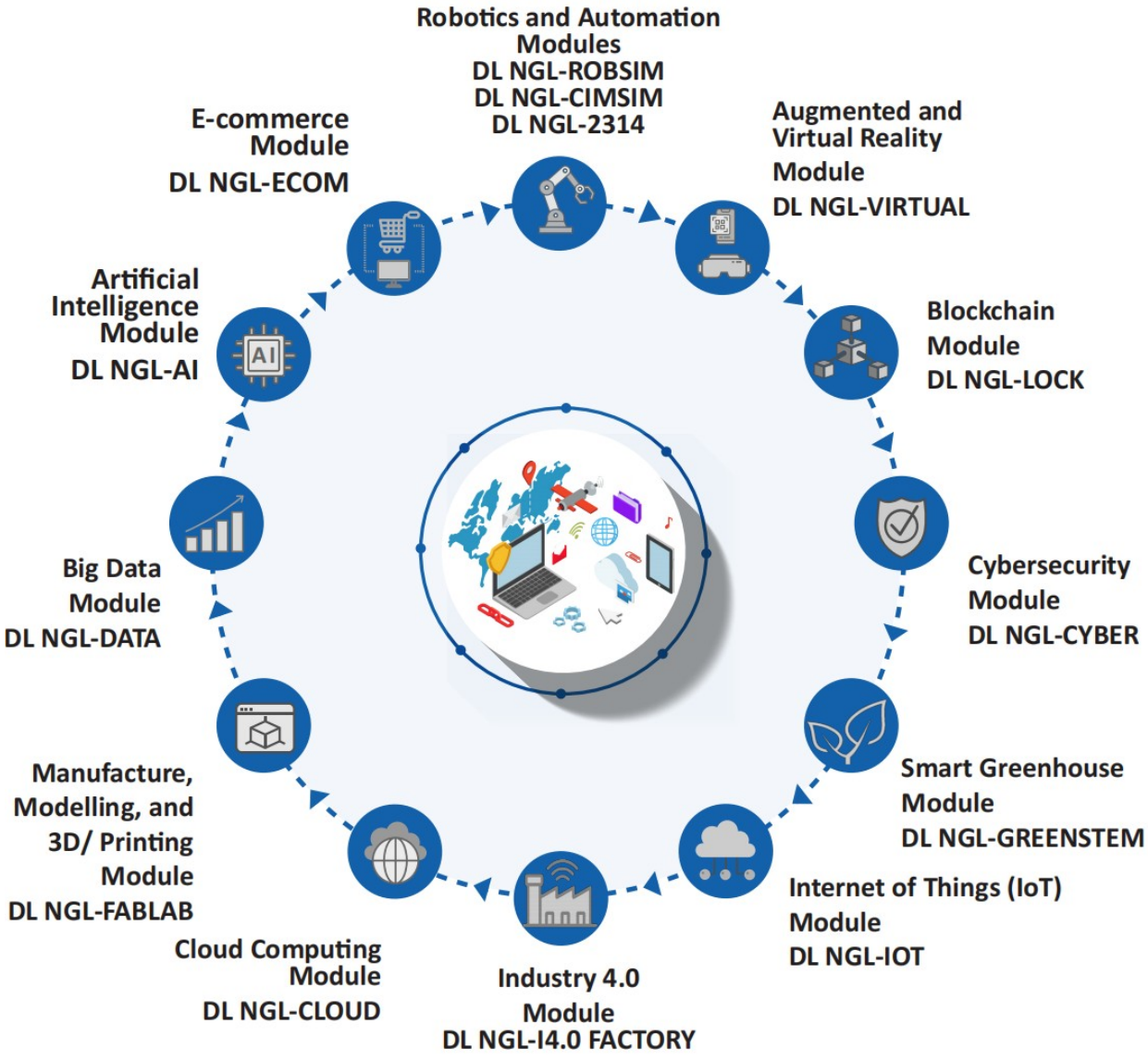
The software is used both by the teacher for teaching and by the students for learning. All student activity is stored in a local database for later reference by the teacher.

Regardless of the application used, it is always possible to carry out preliminary teaching experiences relating to the Internet and its services, such as: OSI model and communication protocols, LAN and WiFi networks, Client-Server model, World Wide Web (HTTP protocol), e-mail (SMTP protocol), file transfer (FTP protocol) and Domain Name System.



THEMATIC MODULES

The modularity of the system allows the thematic modules to coexist with each other within the laboratory without reciprocal limitations, allowing maximum flexibility of use.
While one student (or group) works, for example, on an IoT application, another group can work on the development of e-commerce applications and another on robotics or other applications.



Internet of Things (IoT) Module

DL NGL-IOT

It is used to study all the problems related to the world of the Internet of Things IoT, in which not only people, but also the most common objects can connect to a global network where they can be viewed and controlled by both other objects and network users.
There is no limitation to the type of object that can be connected, thus providing the Internet of Things with an unlimited space of applications: Industry, home automation, medicine, etc.

The module contains devices and tools to configure a complete IoT system where to carry out all exercises and experiments and consists of: Interface card (including a microcontroller, an LCD display, a keyboard and USB interfaces, Ethernet LAN, WiFi, for analog sensors, for digital sensors and actuators), analog sensors (temperature, pressure, force) and digital sensors (brightness, ultrasonic distance, acceleration), actuators (DC motor and stepper motor).

With the module you can study all the problems related to the world of IoT: Characteristics and performance of the devices to connect (sensors, actuators, ...), communication technologies (protocols, networks, ...), information technologies (servers, databases, clients, ...) and performance analysis.

The module also allows the use of MiniSim cards, simulators of real situations that, thanks to the use of an internal microcontroller, allow the student to interact with the simulated system and learn the methods and objectives of the Internet of Things. The description of the simulation cards can be found on the following pages.

Didactic simulators for IoT

The MiniSims are small simulators designed for educational use in the study of Internet of Things (IoT) technology and its applications in various sectors, such as: Agri-food, energy, automotive, manufacturing, etc. computer, health, chemical and biotechnological.

They simulate, through an internal microcontroller, the operation of a computer, a plant, a system, etc., interacting with the student and generating all the information for the connection to the IoT, thus allowing to achieve one of the main objectives of this technology, what is to be seen or controlled by both other objects and network users.
A real IoT system is composed of objects (equipment, plants, systems, etc.), communication networks, servers and clients. An important feature of the MiniSims is to reproduce the entire IoT system on a single workstation, in an 'open' way, where the student can interact autonomously with the different parts of the system.

To use the MiniSims you need the IoT module, in particular, the DevIoT unit for the physical connection of the simulator to the cloud and the DL Workspace application that contains the servers and clients for the full operation of the system.
Experiments can be performed on a single computer, using all the tools of the DL Workspace software

The simulators are connected to the DevIoT unit that sends the information from the simulators to a cloud server. All cloud components are present on the PC.
A LAN connection is used between the DevIoT unit and the PC, in which the MQTT server of the DL Workspace is activated, which receives all the information from the simulators and saves it in a database.
The DL Workspace HTTP server is then used to provide database information to a "remote" user via a web in-terface. On a PC (or on any mobile device) simply using a browser and opening the HTTP server web page with real-time updated information about the state of the simulated plants.

The simulators available are as follows:

- DL MiniSim-ENE1: Domestic photovoltaic system with remote monitoring of operating parameters.
- DL MiniSim-CAR1: Connected car, remote monitoring and diagnosis.
- DL MiniSim-MAN1: Simulation and control of an intelligent factory.
- DL MiniSim-BIO1: Telemedicine, electrocardiogram with remote viewing.
- DL MiniSim-AGR1: Agri-food 4.0 in greenhouses.
- DL MiniSim-CHI1: Chemistry 4.0, remote monitoring of a chemical plant.

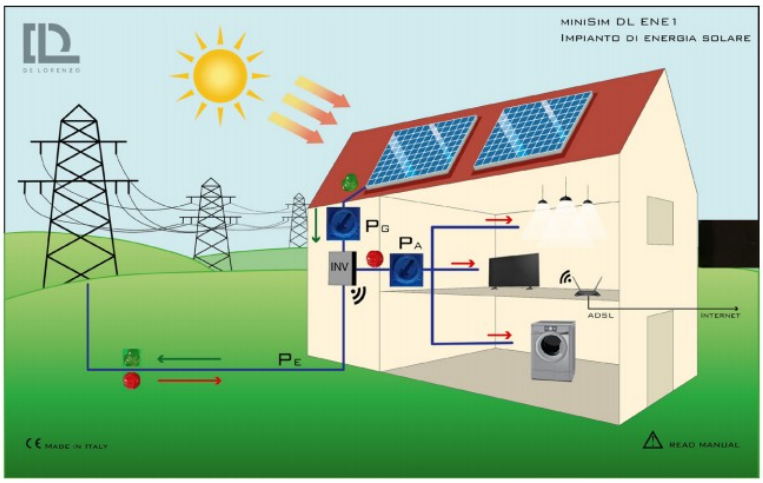
DL MiniSim-ENE1
Home photovoltaic system with remote monitoring of operating parameters

Electric power production systems using photovoltaic panels are increasingly used in the home.

Currently, most of them allow to monitor the system remotely using a PC or a mobile phone using IoT techniques.

The control unit present in the house that uses a domestic connection to the internet sends the production and consumption data via the IoT protocol to a server installed anywhere in the world.

From anywhere else in the world, you can connect to this server and view the data using a simple web interface and HTTP protocol.



The simulator of the DL MiniSim-ENE1 solar system is used, which shows a screen print of the components of the domestic system, and allows to vary, through the potentiometer, the energy produced by the solar panels (to simulate different environmental conditions) and the energy absorbed by the domestic charges. The power absorbed or sent to the network operator is calculated with a subtraction.

he connected car is a concept that until a few years ago was considered science fiction and has now ecome a reality. It is the foundation of many applications, including autonomous driving.
he first applications originated in Formula 1, where it was important to know the condition of the ehicle on the track. Then, with the advancement of technology, particularly that of the Internet of hings (IoT), they expanded to many other sectors.
n this simulator two important applications are proposed, one for remote monitoring of the vehicle o know its health, safety, etc., and another for remote diagnostic operations in real time.
he simulator shows a real system in which a car is constantly connected to the internet and herefore the information from it is available, anywhere, for the monitoring and diagnostic perations mentioned above.

Use the DL MiniSim-CAR1 that contains:

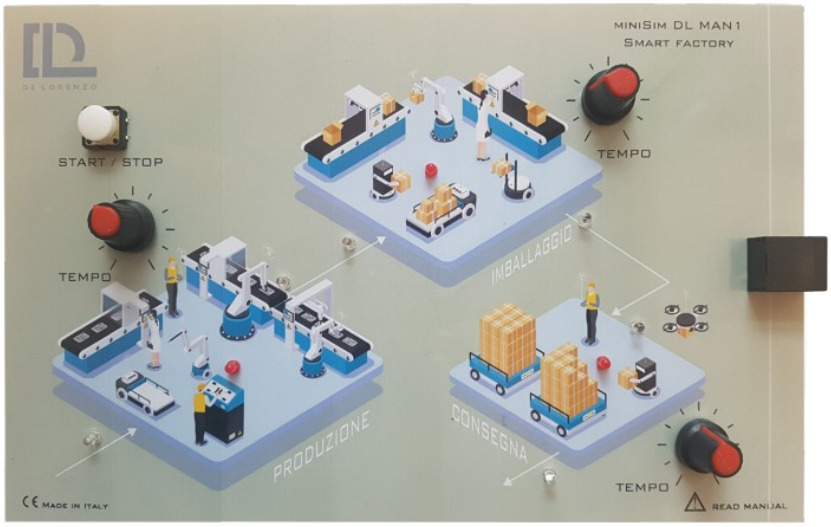
- The scheme of the connected car,
- A car start/stop switch
- A potentiometer to vary the number of engine revolutions.
- Software that calculates the machine's operating parameters in real time.
- A switch for inserting faults in the car.

he DL Workspace also contains a car dashboard, which displays the actual dashboard remotely, and n OBD scan tool for troubleshooting.

DL MiniSim-MAN1
Simulation and control of a smart factory

The Smart Factory is a definition used to describe the use of different digital technologies in order t manage all operations within a production reality.
One of the most suitable technologies to use in an intelligent factory is the Internet of Things (IoT) since it allows the exchange of information between different devices, without human intervention to synchronize the general operation of the system.
The simulator shows a "real" system, in which 3 workstations cascade together to make a product Station 1 represents the reception of semi-finished products, Station 2 represents the processing o the product, and Station 3 represents the packaging of the finished product.

In a traditional factory, the system would be governed by a control station (Master) that controls th three workstations (Slaves) and thus coordinates their operation.
In an intelligent factory that uses Internet of Things techniques, the 3 workstations are object (things) that communicate their status to a server and receive information from the server relativ to the status of the other stations, that is, they exchange the status between them.
Station 1 will inform when it is free to accept incoming materials, Station 2 will indicate tha production is working, and Station 3 will give the availability of the outgoing product. In this wa each station is able to operate in coordination with the others without the need for superior contro logic.



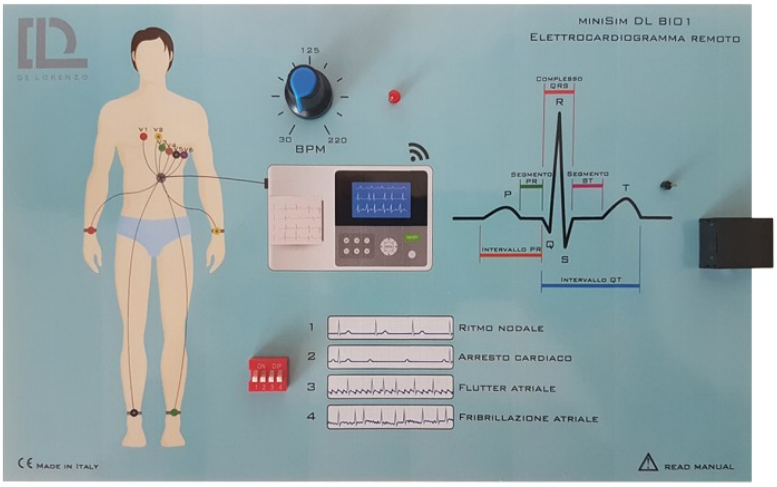
The DL MiniSim-MAN1 is used, which shows a screen print of the components of the complet system and shows the status of the different workstations through multi-colored LEDs.

Telemedicine is defined as a way of providing health services using innovative technologies, in particular Information and Communication Technologies (ICT), in situations where the healthcare professional and the patient (or two professionals) are not in the same place. Telemedicine involves the secure transmission of medical information and data in the form of texts, sounds, images or other forms necessary for the prevention, diagnosis, treatment and subsequent follow-up of patients.

Telemedicine services can be used with any diagnostic or therapy health service.
However, the provision of telemedicine does not replace the traditional provision of health care in the doctor-patient relationship, but complements it to potentially improve effectiveness, efficiency and adequacy.

The simulator shows a 'real' system in which a patient performs an electrocardiogram, and the doctor controls it in real time remotely.
On the DL MiniSim-BIO1, the ECG signal is generated continuously. A potentiometer allows you to vary the rate from 30 to 220 beats per minute.

It is possible to generate different types of ECGs (the waveform is generated by the microcontroller within the panel) and a dip switch on the panel allows you to select different ECGs with different pathologies.

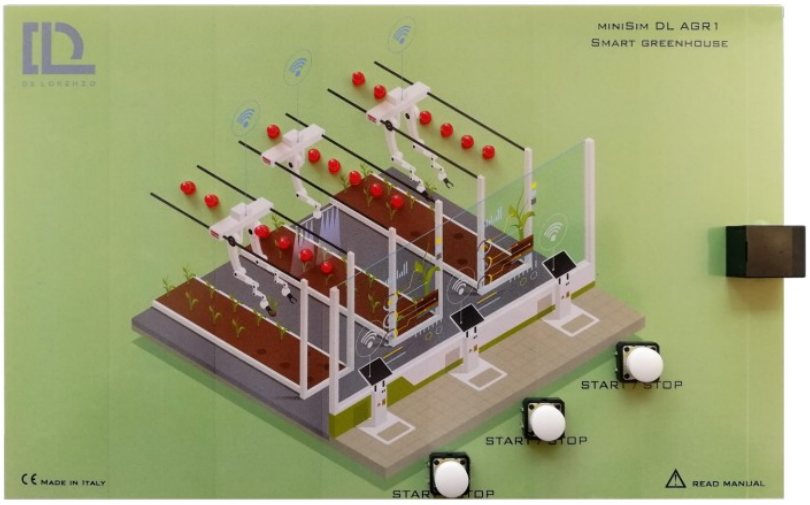


The DL MiniSim-BIO1 is used, which displays a screen print of the entire system components and generates a simulated voltage ECG signal.

DL MiniSim-AGR1
Food Agriculture 4.0 in greenhouses

Food agriculture 4.0 aims to integrate digital technologies and agricultural production to achieve a reduction in energy consumption and resources used in the greenhouse and in the field.
Information technology, which allows remote monitoring of the environment and plants, can ensure favorable environmental conditions for the crop, leading to the objective of increasing the productivity and health of crops, also reducing the use of agrochemicals. In particular, Internet of Things (IoT) technologies together with new intelligent algorithms allow monitoring plant health remotely and coordinating phytosanitary and greenhouse energy management in an integrated manner, in order to optimize crop health and energy consumption.

The information derived from environmental, energy and agricultural monitoring exploits the transmission on the Internet, to be processed remotely from any point thanks to the development of new intelligent algorithms in order to visualize and implement control strategies.
The simulator shows a "real" 4.0 greenhouse system, with an automatic irrigation system, sensors to monitor the weather conditions and actuators to adjust the conditions themselves.



The DL MiniSim-AGR1 which shows a screen print of the components of the complete system, also contains:

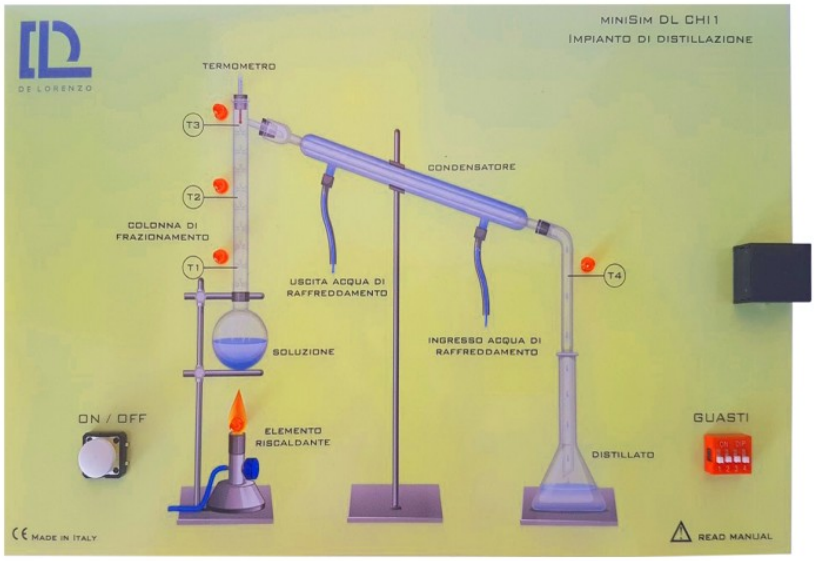
- A LED bar showing the position of the irrigation cart.
- A cart start/stop switch.
- The following DevIoT unit resources are also used:
- The actual temperature sensor with PT100 probe.
- The real DC motor for a simple remote temperature control.

It is possible to observe in real time the position of the irrigation cart and the temperature value and start or stop the irrigation cart and the fan motor.

While Chemistry 1.0 can be identified as that of coal, Chemistry 2.0 as petrochemistry, Chemistry 3.0 as that of globalization and specialization, Chemistry 4.0 means above all circular economy and digitalization (new paradigms of material production and recovery are used to maximize the use of existing molecules.)

Internet of Things (IoT) technologies are also located in Chemistry 4.0 as tools for the digital collection of all plant data, for real-time monitoring operations, for operations to verify their health status and early detection of possible breakages, and for operations to verify their health for the optimization of production and the reduction of raw material consumption.

The simulator shows a 'real' Industrial Distillation Chemical Plant, in its various components that make it controllable and manageable remotely through IoT technologies.



The DL MiniSim-CHI1 which shows a screen print of the distillation system in all its components, also contains a microcontroller inside which allows the simulation of the operation of the plant.
During the simulation, all the values of the main physical magnitudes that characterize the system are calculated in real time.

E-commerce Module

DL NGL-ECOM

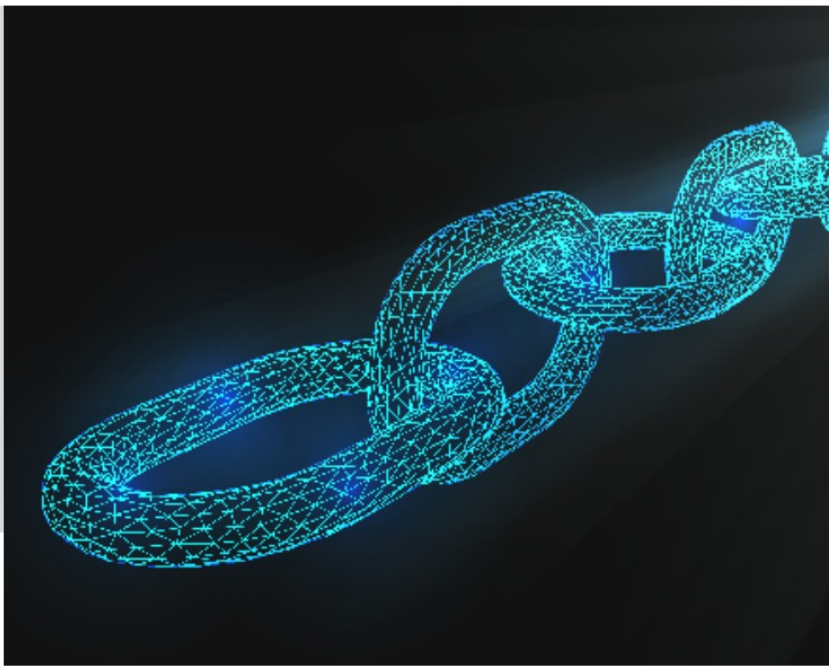
It deals with the problems of e-commerce at a didactic level, that is, the activities of selling and buying products on the Internet.
It allows to configure and use a complete electronic commerce system within the laboratory where, from each job, it is possible to build websites and manage commercial transactions related to the purchase and sale of products and services.
Each workstation can also operate in system user mode for operation verification.

- It consists of a server equipped with all the necessary software applications:
- Personal computer
- Ubuntu operating system
- Apache Web Server
- MySQL database
- WordPress
- E-commerce platform

It allows the study of B2B and B2C e-commerce, Content Management Systems (CMS) to create websites, the creation of e-commerce-oriented websites, database management, product pages, price lists and digital storefronts, electronic payments, and shipping management.

Blockchain Module

DL NGL-BLOCK



It contains the tools to analyse at a didactic level the technologies of Distributed Ledger in general and the blockchain in particular.
Blockchain technology exploits the characteristics of a computer network of nodes for the distributed management of a record containing data and information, uniquely and securely, using a shared mode that does not require a central control and verification entity.
The applications in which this technology can be used are those that do not require mediation and/ or centralization entities. Bitcoin virtual currency is an example of blockchain application.

The module is equipped with its own Blockchain Platform, specially developed to analyse this type of applications at a didactic level.

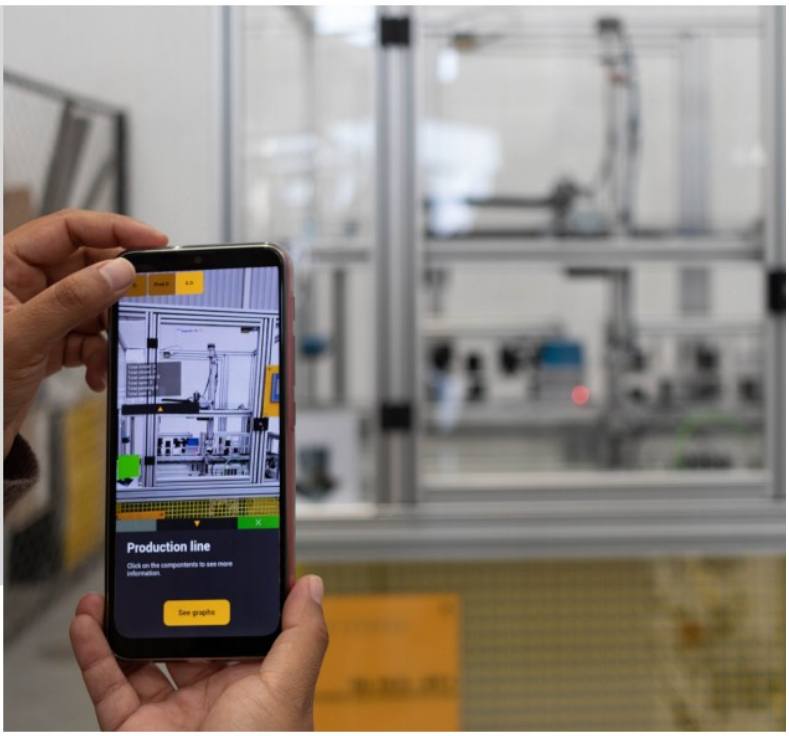
Supports:

- A peer-to-peer network for information exchange
- A distributed ledger
- An authorized network (authorized blockchain)
- Traceability of transfers
- Encryption of transactions
- The immutability of the records and transparency and verifiability.

It allows to study the technologies of Distributed Ledger, characteristics of decentralization, disintermediation, traceability, transparency and immutability of the registry, blockchain with and without authorizations and cryptocurrencies (Bitcoin).

Virtual and Augmented Reality Module

DL NGL-VIRTUAL



It contains the devices and tools for the study and learning of all the issues related to these technologies of the computer world, particularly interesting in their educational applications.
Virtual reality (VR) aims at active participation, taking the user from the material to an abstrac very real dimension.
Augmented Reality (AR) allows to amplify some perceptions of reality using technological de giving the possibility to those who use it to live experiences and nuances of reality that othe would not be possible to know.

The module consists of:

- Windows PC with high performance graphics card.
- Software for the creation of applications in virtual and augmented reality: Ga environments, and simulations.
- VR visor kit used to run applications and enter virtual reality: Portable viewfinder surroundin user's field of view, controller for interaction with virtual reality, power supply.

DE LORENZO

Big data Module

DL NGL-DATA

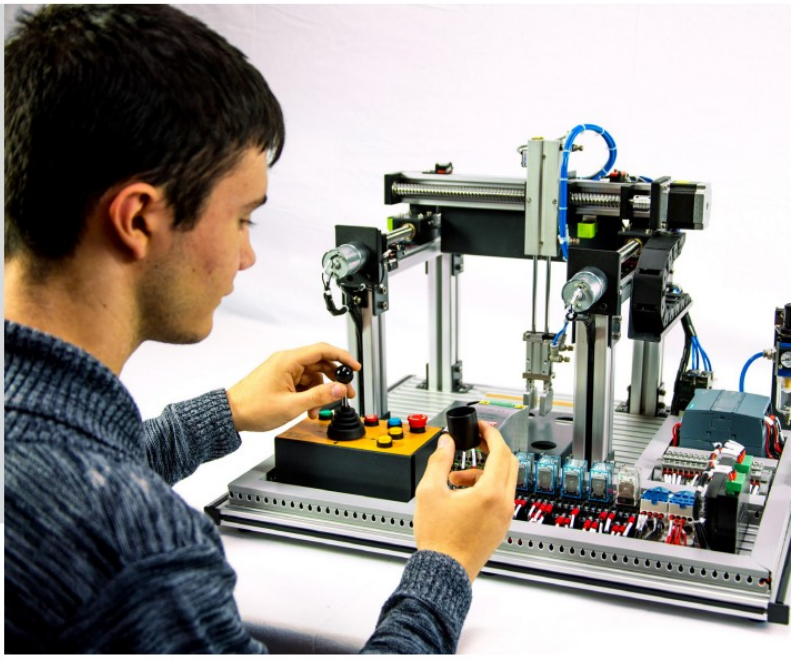
The module addresses the study of processing and analysis of large amounts of data in the field of Data Science.
Data Science is a fairly recent science that allows to manage large amounts of data, overcoming the limitations of traditional databases, and allows its processing without the need for programming language skills.

It provides easy-to-use GUI (Graphical User Interface) tools that allow anyone with minimal specific knowledge to store, manipulate and model data.
The module consists of a Data Science platform that can be used on all workstations in the laboratory, allowing:

- Real-time data processing
- Treatment of historical data
- Programming in Python, Java, and R
- Graphical data analysis
- Machine learning

The module involves using Apache Spark, a unified analytics engine for large-scale data processing with built-in modules for SQL, data flows, machine learning, and graph processing, which also allows to use streaming data that could, for example, come from IoT sensors.

Robotics and Automation Modules.



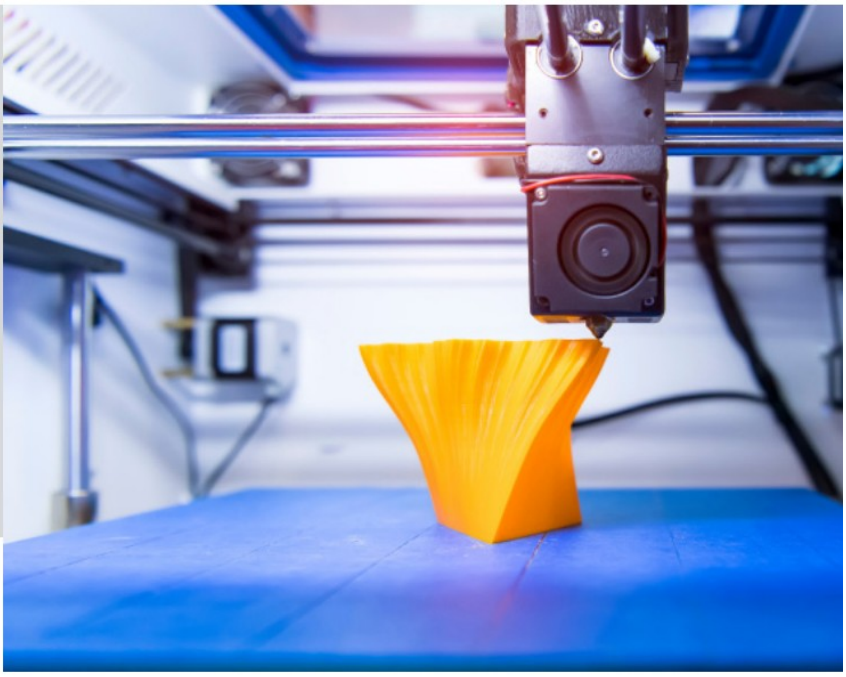
It contains devices and tools for the study and learning of topics related to the robotics and automation sectors, solutions that are at the centre of industry 4.0 thanks to the remarkable development that has taken place in recent years in the field of software and hardware.
The applications of industrial robots are in fact countless. In particular, industrial automation is found in the automotive, aerospace, food, biotechnology, chemical, electronic, medical, nautical and other sectors.
The proposed module consists of a series of didactic hardware systems, each equipped with an electronic interface board, and can be connected to any workstation through the Cloud.

The teaching systems available for this application include:

- DL NGL-ROBSIX and DL NGL-CIM-SIM robotic demonstrators, complete with sensors and actuators representative of the mobility and handling properties characteristic of industrial robots. They allow the development of comprehensive courses on robotic control systems and are equipped with SCADA software for the study of automation and concepts of Industry 4.0.
- DL NGL-2314 Systems for the study of industrial process control that effectively guarantee the safety of the plant and operators, maximize productivity, and minimize waste.

With the modules it is possible to study the problems related to the world of robotics and industrial automation: Characteristics and performance of the devices to be connected (sensors, actuators), communication technologies between devices, control techniques and methodologies, performance analysis and safety of systems.

3D Manufacturing, modelling, and printing module DL NGL-FABLAB



3D printing is one of the latest revolutionary technologies, completely changing the way we can learn, research and prototype, creating something physical out of nothing.

This module consists of a comprehensive course on the most important topics for 3D printing, offering a detailed description of the 4 fundamental steps:

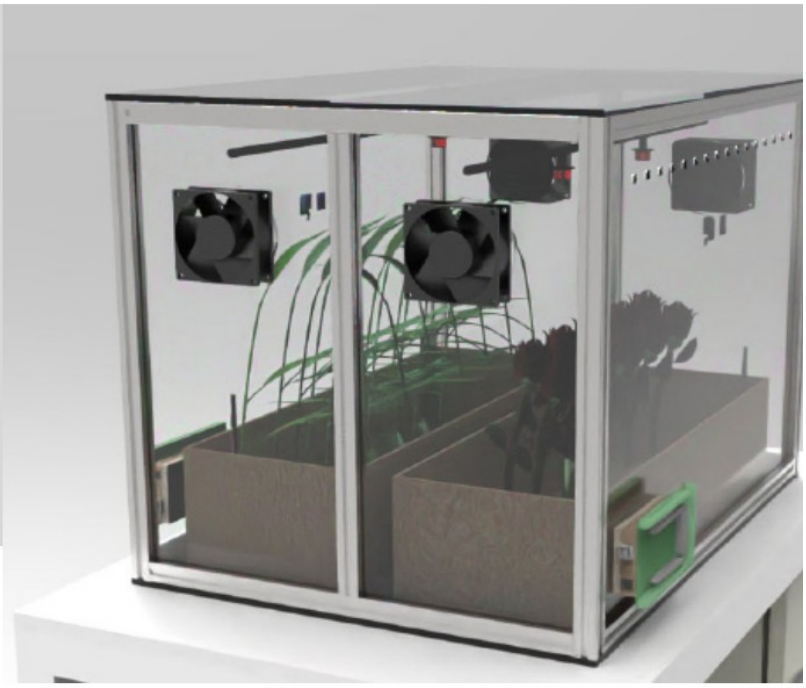
- Planning
- Modelling
- 3D Printing
- Applications.

The course is developed to teach the basic concepts of 3D modelling, mechanics, and model resistance, and you will master the preparation of print files to create indispensable objects in areas such as prototyping, architecture, automotive and all those fields of application that previously required the collaboration of multiple partners.

The module consists of a 3D printer and design and printing software that makes 3D modelling accessible to everyone, with a complete and easy-to-use toolset.

Smart Greenhouse Module

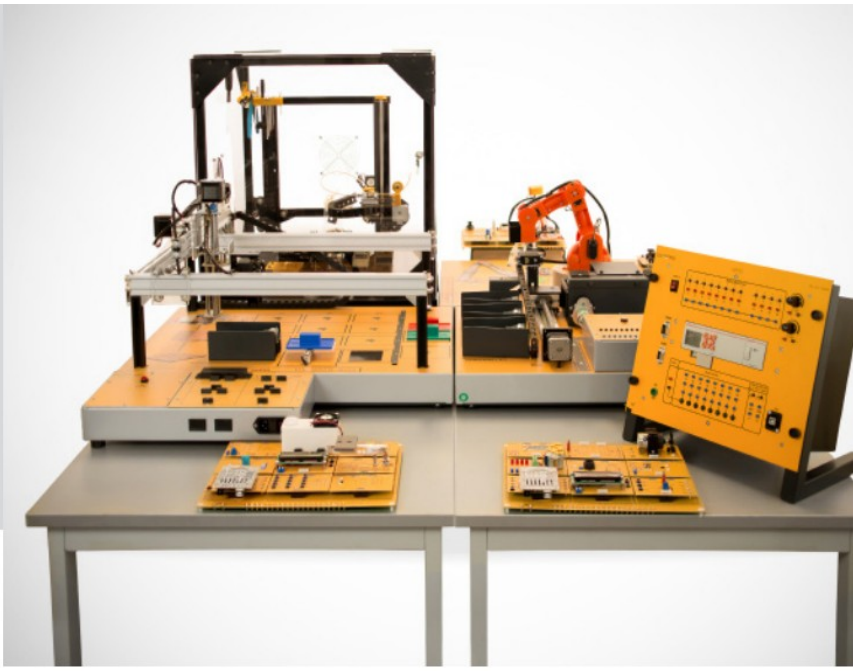
DL NGL-GREEN-STEM



Perfect for a first approach to botany, where young people can create their own cultures in an environment with a rich educational content.
It consists of 2 zones, where for each of them it is possible to monitor humidity, temperature and lighting. The sensors in the greenhouse are connected to a dedicated Arduino board, which takes care of data acquisition and communication.
Through a dedicated software, it is possible to communicate with the Arduino board to acquire and analyse data directly from the PC.
Communication with the system can also be done remotely via a Wi-Fi connection.
It allows checking the optimal ambient humidity and temperature values based on the type of crop as well as the optimal pH values in the soil.
It is provided with ventilation and heating, to regulate the parameters based on environmental conditions, drip and sprinkler irrigation, containers for substrate or soil, a water pump and a set of sensors for temperature, humidity, flow, light and pH.

Industry 4.0 Module

DL NGL-I4.0 FACTORY



ıe digitization of information, combined with high-performance hardware, allows the ıplementation of more flexible and optimized production architectures. The level of innovation is ıch that, today, Industry 4.0 is synonymous with smart manufacturing.
ıe DL NGL-I4.0 FACTORY is composed of a set of electronic boards and simulators to create a small ıart factory.

sing an Arduino open-source microcontroller connected to a SCADA supervisory software for ata acquisition and system control, students are able to perform practices covering topics from troductory automation and robotics to protocols of communication, to sensors and actuators up to complete study of a production process.

ıe simulators provided with this application are the following:

- **DL NGL-ROBSIM** (for the study of a robotic arm),
- **DL NGL-CIMSIM** (for the study of a conveyor belt),
- **DL NGL-WMS-SIM** (for the study of a smart warehouse).

ıe integration of the entire factory with its stations is performed through a **SCADA** system for ıonitoring, handling, and control of the entire production process with the aid of the **L WORKSPACE** software.

DL NGL NEXT GENERATION LABS

Laboratory for the digital professions of the future

DL NGL LAB

DL NGL-BASE
-Basic Panel
-Teacher's computer (i5 - 8 GB RAM - 256 SSD) including keyboard, mouse, 27-inch monitor and DL WORKSPACE software

DL NGL-STUDENT
-Student computer (i5 - 8 GB RAM - 256 SSD) including keyboard, mouse, 27-inch monitor and DL WORKSPACE software
It should be multiplied by the number of student workstations required in the lab.

IOT Module
DL NGL-IOT
-DevIoT sensor and actuator unit
-Software and instruction manual
It must be multiplied by the number of workstations required. It is installed on the student workstations (DLNGL-STUDENT).

Cybersecurity Module
DL NGL-CYBER
- Software and didactic manual. It requires the DL NGL-IOT module to operate. It is installed on all student workstations (DL NGL-STUDENT) with the DL NGL-IOT module installed.

Cloud Computing Module
DL NGL-CLOUD
-Dedicated server
-Software and didactic manual
By purchasing 1 DL NGL-CLOUD module, the software can be installed on all student workstations (DL NGL-STUDENT).

DL NGL-ECOM
-Dedicated server
-Software and didactic manual
-By purchasing 1 DL NGL-ECOM module, the software can be installed on all student workstations (DL NGL-STUDENT).

DL NGL-BLOCK
- Software and didactic manual
By purchasing 1 DL NGL-BLOCKCHAIN module, the software can be installed on all student workstations (DL NGL-STUDENT).

DL NGL-DATA
-Software and didactic manual
By purchasing 1 DL NGL-DATA module, the software can be installed on all student workstations (DL NGL-STUDENT).

Artificial Intelligence
DL NGL-AI
-Software and didactic manual
By purchasing 1 artificial intelligence module, the software can be installed on all student workstations (DL NGL-STUDENT).

Robotics Module -
DL NGL-ROBSIM
5-axis robot module with didactic manual.
It must be multiplied by the number of workstations required.

Augmented and Virtual Reality
DL NGL-VIRTUAL
-Workstation with dedicated graphics card, keyboard, mouse, and monitor
-Viewer
Software and didactic manual
It must be multiplied by the number of workstations required.

Robotics Module
DL NGL-CIMSIM
Conveyor belt with didactic manual. It must be multiplied by the number of workstations required.

3D Printing Module
DL NGL-FABLAB
3D printer module with teaching manual and software.
It must be multiplied by the number of workstations required. The software can be installed on all student workstations (DL NGL-STUDENT).

Automation Module
DL NGL-2314
- Process control with didactic manual. It must be multiplied by the number of workstations required.

Module Industry 4.0
DL NGL-I4.0 FACTORY
Electronic boards and simulators to create a small smart factory.
It must be multiplied by the number of workstations required.

Module Smart Greenhouse
DL NGL-GREENSTEM
Two-zone greenhouse with sensors, software and Wi-Fi connection.
It must be multiplied by the number of workstations required.

MINISIM

Each of the modules listed below requires the DL NGL-IOT module to function properly:

DL MiniSim-AGR1
Agrofood 4.0 in greenhouses.

DL MiniSim-ENE1
Domestic photovoltaic system with remote monitoring of operating parameters.

DL MiniSim-CAR1
Connected car, remote monitoring, and diagnostics.

DL MiniSim-MAN1
Simulation and control of a Smart Factory.

DL MiniSim-BIO1
Telemedicine, electrocardiogram with remote viewing.

DL MiniSim-CHI1
Chemistry 4.0, remote monitoring of a chemical plant.

Carico induttivo

Composto da 3 induttanze, con possibilità di collegamento a stella, a triangolo e in parallelo, comandato da 3 interruttori con sette gradini ognuno.
Max. energia reattiva nel collegamento monofase o trifase: 900 VAr
Tensione nominale: 380/220 V Y/D
Tensione nominale in monofase: 220 V

Inductive load

Composed of three inductances, with possibility of star, delta and parallel connection, controlled by three switches with seven steps each.
Max. reactive power in single or three-phase connection: 900 VAr
Rated voltage: 380/220 V Y/D
Rated voltage in single-phase: 220 V

Carga inductiva

Compuesta por tres inductancias, con posibilidad de conexión en estrella, en triángulo y en paralelo, controlada por tres interruptores con siete pasos cada uno.
Energía reactíva máxima en la conexión monofásica o trifásica: 900 VAr
Voltaje nominal: 380/220 V Y/D
Voltaje nominal en monofásica: 220 V

Charge inductive

Composée de trois inductances, avec possibilité de connexion à étoile, à triangle et en parallèle, commandée par trois interrupteurs avec sept positions chacun.
Max. énergie réactive dans la connexion monophasée ou triphasée: 900 VAr
Tension nominale: 380/220 V Y/D
Tension nominale en monophasée: 220 V

DL 10065N

Modulo di misura digitale della potenza elettrica

Misura in corrente continua di: tensione, corrente, potenza ed energia.
Misura in corrente alternata di: tensione, corrente, potenza, energia attiva, energia reattiva, energia apparente, cosphi e frequenza.

- Tensione continua: 300 V
- Corrente continua: 20 A
- Tensione alternata: 450 V
- Corrente alternata: 20 A
- Potenza: 9000 W

Alimentazione monofase: 90-260 V, 50/60 Hz
Comunicazione: RS485 con protocollo MODBUS RTU

Electrical power digital measuring unit

Measurement of dc voltage, current, power and energy. Measurement of AC voltage, current, power, active energy, reactive energy, apparent energy, power factor and frequency.

- Direct voltage: 300 V
- Direct current: 20 A
- Alternate voltage: 450 V
- Alternate current: 20 A
- Power: 9000 W

Single phase power supply: 90-260 V, 50/60 Hz
Communication: RS485 with protocol MODBUS RTU

Módulo de medida digital de la potencia eléctrica

Medida en corriente directa de: tensión, corriente, potencia y energía.
Medida en corriente alterna de: tensión, corriente, potencia, energía activa, energía reactiva, energía aparente, cosphi y frecuencia.

- Tensión continua: 300 V
- Corriente continua: 20 A
- Tensión alterna: 450 V
- Corriente alterna: 20 A
- Potencia: 9000 W

Alimentación monofásica de red.
Comunicación: RS485 con protocolo MODBUS RTU

Unité de mesure numérique de puissance électrique

Mesure en courant continu de: tension, courant, puissance et énergie.
Mesure en courant alternatif de: tension, courant, puissance, énergie active, énergie réactive, énergie apparente, cosphi et fréquence.

- Tension continue: 300 V
- Courant continu: 20 A
- Tension alternative: 450 V
- Courant alternatif: 20 A
- Puissance: 9000 W

Alimentation monophasée: 90-260 V, 50/60 Hz
Communication: RS485 avec protocole MODBUS RTU

DL 1021/4

Motore asincrono trifase a gabbia di scoiattolo

Motore ad induzione con avvolgimento trifase sullo statore e con gabbia di scoiattolo annegata nel rotore.

- Potenza: 1,5 kW
- Tensione: 230/400 V Δ/Y
- 4 poli
- Velocità: 1420 rpm, 50 Hz
- Velocità: 1720 rpm, 60 Hz

Squirrel cage three phase asynchronous motor

Induction motor with three-phase stator winding and squirrel cage buried in the rotor.

- Power: 1.5 kW
- Voltage: 230/400 V Δ/Y
- 4 poles
- Rated speed: 1420 rpm, 50 Hz
- Rated speed: 1720 rpm, 60 Hz

Motor asíncrono trifásico de jaula

Motor de inducción con devanados trifásicos en el estator y con jaula de ardilla anegada al rotor.

- Potencia: 1.5 kW
- Tensión: 230/400 V Δ/Y
- 4 polos
- Velocidad nominal: 1420 rpm, 50 Hz
- Velocidad nominal: 1720 rpm, 60 Hz

Moteur asynchrone triphasé à cage

Moteur à induction avec enroulement triphasé sur le stator et à cage d'écureuil noyé dans le rotor.

- Puissance : 1.5 kW
- Tension : 230/400 V Δ/Y
- 4 pôles
- Vitesse nominale : 1420 rpm, 50 Hz
- Vitesse nominale : 1720 rpm, 60 Hz

(*) NOTA: Tutti i valori di velocità sono indicati con frequenza operativa di 50Hz. Per il funzionamento a 60Hz, i valori di velocità saranno differenti (20% circa).

(*) NOTE: All speed values are shown with an operating frequency of 50Hz. For 60Hz operation, speed values will differ (around 20%).

(*) NOTA: Todos los valores de velocidad vienen indicados para una frecuencia de funcionamiento de 50 Hz. Para un funcionamiento a 60Hz, los valores de velocidad serán diferentes (aproximadamente 20%).

(*) Remarque: Toutes les valeurs de vitesse sont indiquées par une fréquence de fonctionnement de 50Hz. Pour un fonctionnement à 60Hz, les valeurs de vitesse seront différentes (environ 20%).

DL 2108TAL-CP

Alimentatore trifase

Alimentatore per collegamento trifase con interruttore di rete a 4 poli.
Lampada spia per ogni fase.
Uscita a 5 terminali di sicurezza da laboratorio: L1, L2, L3, N e P.
Interruttore per la connessione a qualsiasi fonte di energia rinnovabile; consente di collegare la rete elettrica alla fonte selezionata, consentendo l'immissione di energia nella rete quando la fonte sta generando energia.
Protocollo di comunicazione Modbus RS485.

Three phase supply unit

Power supply unit for three-phase connection with 4-pole cam mains switch.
Three-phase indicator lamps.
Output through 5 safety terminals: L1, L2, L3, N and PE.

Switch for connecting to any renewable energy sources; it allows the electrical grid to be connected to the selected source, enabling the injection of energy into the grid when the source is generating power.
Modbus RS485 Protocol Communication.

Módulo de alimentación trifásica

Módulo de alimentación para conexiones trifásicas con interruptor de red de 4 polos.
Lámpara indicadora para cada fase.
Salida de 5 terminales del laboratorio: L1, L2, L3, N y PE.
Interruptor para conexión a cualquier fuente de energía renovable; permite conectar la red eléctrica a la fuente seleccionada, posibilitando la inyección de energía a la red cuando la fuente está generando energía.
Protocolo de comunicación Modbus RS485.

Module d'alimentation triphasée

Module d'alimentation pour connexion triphasée avec interrupteur de réseau à 4 pôles.
Témoin lumineux pour chaque phase.
Sortie à 5 terminaux: L1, L2, L3, N et PE.
Interrupteur de connexion à n'importe quelle source d'énergie renouvelable ; il permet de connecter le réseau électrique à la source sélectionnée, permettant l'injection d'énergie dans le réseau lorsque la source produit de l'électricité.
Protocole de communication Modbus RS485.

DL 2100TTI

Trasformatore trifase di isolamento

Trasformatore di isolamento da collocare tra la rete trifase e i laboratori per fornire una tensione trifase secondaria con neutro isolato adatto per il funzionamento dei moduli.

Caratteristiche tecniche:

- Ingresso di rete trifase con regolazione +10%/-10%
- Uscita: 400V con regolazione +5%/-5%
    - 3 x presa trifase CCE (3P+N+E)
    - 2 x presa monofase CCE (2P+E)
    - 2 x single phase type F socket
- Protezione magneto termica 16 A, 30 mA
- Interruttore di protezione del motore: 6.3 a 10 A
- Pulsante di arresto di emergenza a fungo
- Massima uscita in potenza: 6 KVA

Three-phase isolation transformer

Isolation transformer to be placed between the three-phase mains and the laboratories providing a three-phase secondary voltage with isolated neutral suitable for the modules operation.

Technical features:

- Three-phase mains input with +10%/-10% adjustment.
- Output: 400V with +5%/-5% adjustment.
    - 3 x three phase CEE sockets (3P+N+E)
    - 2 x single phase CEE sockets (2P+E)
    - 2 x single phase type F socket
- 16 A, 30 mA differential magneto-thermal protection.
- Motor-protection circuit-breaker: 6.3 to 10 A.
- Mushroom emergency stop push-button
- Maximum output power: 6 KVA

LIGHT SOURCE
DL SIMSUN

This product is used to provide suitable lighting to the photovoltaic solar module that is use in the photovoltaic trainer system trainers. The light intensity can be manually adjusted through a potentiometer or automatically controlled through a 0-10 V input or RS485 serial port using Modbus protocol, to allow performing experiments with different light intensities, therefore simulating the light conditions from dawn to twilight.

The DL SIMSUN includes the following main components:

- Dimmer for manual light intensity control
- 12 halogen lamps, 120 W each
- Mobile structure mounted on wheels
- 10A magneto-thermal switch, 30mA RCCB
- Switch for control modes: Local, Modbus or analogue 0-10V
- RS485 serial ports

Module supply voltage: Single phase by the mains

DL 9031

Interruttore magnetotermico differenziale

Interruttore da inserire tra la fonte di alimentazione e gli altri moduli DL.

- Corrente Max.: 10A
- Soglia di intervento differenziale: 30mA

Circuit breaker

Circuit breaker to be inserted between the power source and other DL modules.

- Current Max.: 10A
- Intervention threshold differential: 30mA

Interruptor magneto-térmico diferencial

Interruptor de insertar entre la fuente de alimentación y los demás módulos DL.

- Corriente Max.: 10A
- Intervención diferencial: 30mA

Interrupteur magnétothermique différentiel

Interrupteur à insérer entre la source d'alimentation et les autres modules DL.

- Courant Max.: 10A
- Seuil d'intervention différentielle: 30mA

DL 9030

Misuratore di potenza e di energia monofase

Strumento utilizzato nei laboratori di energie rinnovabili per misurare i parametri elettrici in un circuito monofase. È capace di misurare tensioni, correnti, potenza attiva, potenza reattiva, potenza apparente, fattore di potenza, frequenza, THD, energia attiva e reattiva. Comunicazione seriale tramite porta RS-485 utilizzando il protocollo Modbus RTU.

Single-phase power and energy meter

Instrument used in the renewable energies laboratories to measure electrical parameters in a single phase circuit. It is able to measure voltages, currents, active power, reactive power, apparent power, power factor, frequency, THD, active and reactive energy. Serial communication via RS-485 port using Modbus RTU protocol.

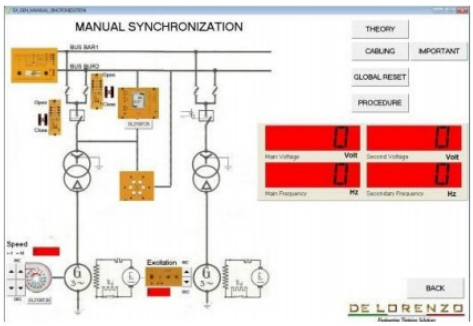
Medidor de potencia y de energía monofásico

Instrumento utilizado en los laboratorios de energías renovables para medir los parámetros eléctricos en un circuito monofásico. Es capaz de medir tensiones, corrientes, potencia activa, potencia reactiva, potencia aparente, factor de potencia, frecuencia, THD, energía activa y reactiva. Comunicación serial mediante puerta RS-485 usando el protocolo Modbus RTU.

Compteur de puissance et d'énergie monophasé

Instrument utilisé dans les laboratoires d'énergies renouvelables pour mesurer les paramètres électriques dans un circuit monophasé. Il est capable de mesures les tensions, les courants, la puissance active, la puissance réactive, la puissance apparente, le facteur de puissance, la fréquence, THD, énergie active et réactive. Communication série à travers le port RS-485 en utilisant le protocole Modbus RTU.

DL SCADA3+



SCADA software

Software SCADA in per acquisizione dati e controllo. Possibilità di mostrare con la possibilità di visualizzare l'applicazione nei vari dispositivi collegati nella stessa rete.

SCADA software

SCADA software for control and monitoring. With the possibility to show the application to different devices connected in the same network.

SCADA software

Software SCADA para adquisición de datos y control. Con posibilidad de mostrar la aplicación a diferentes dispositivos conectados en la misma red.

SCADA logiciel

Software SCADA pour acquisition de données et contrôle. Avec la possibilité de montrer l'application à différents périphériques connectés au même réseau.

DL 2108T25

Relè di sincronizzazione con il generatore

Il relè di sincronizzazione misura la tensione e la frequenza di due ingressi; la tensione, la frequenza e l'angolo di fase dell'ingresso Generatore (G) sono confrontati con quelli dell'ingresso Bus (B) considerato come riferimento.

Funzioni:

- Sincronizzazione automatica e controllo sincronizzato
- Controllo dello spostamento di fase
- Sincronizzazione del generatore con il bus di riferimento
- Modalità di funzionamento Normale/Dead Bus
- Parametri regolabili per l'impostazione della chiusura dell'interruttore
- Differenza di tensione regolabile
- Differenza di frequenza regolabile
- Differenza di fase regolabile
- Misurazione di tensione e frequenza del bus e del generatore
- Misurazione di ΔF, ΔV e Δϕ
- Display LCD multifunzione
- Grafico a barre delle grandezze per il confronto visivo del test
- 1 uscita relè per il controllo di chiusura dell'interruttore
- 2 porte RS485 (maschio/femmina) che supportano il protocollo Modbus RTU.

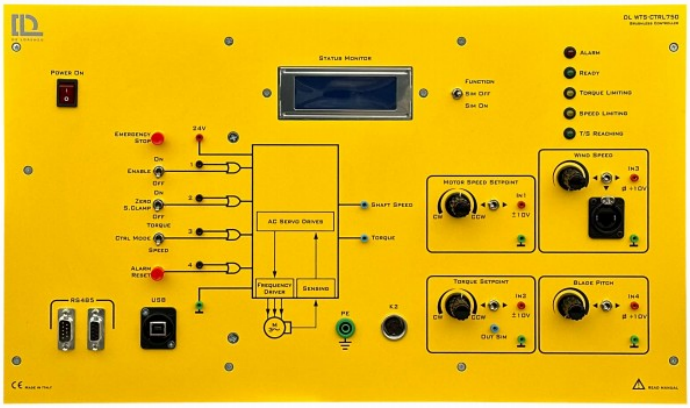
Generator Synchronizing Relay

It is a numerical synchronizing relay which measures voltage and frequency of two inputs; the voltage, frequency and phase angle of the Generator input (G) are individually compared with those of the Bus input (B) considered as reference.

Functions:

- Automatic Synchronization and Synchro-check
- Phase displacement checking
- Synchronising of the generator with the reference bus
- Normal/Dead Bus operation mode
- Adjustable parameters for circuit breaker closing setting
- Adjustable Voltage difference
- Adjustable Frequency difference
- Adjustable Phase difference
- Voltage and Frequency measurement of the Bus and of the generator
- ΔF, ΔV and Δϕ measurement
- Multi-function LCD display
- Bar graph of magnitudes for the test visual comparison
- 1 relay output for circuit breaker close control
- 2 ports RS485 (Male/Female) supporting Modbus RTU protocol.

DL WTS-CTRL750



Modulo di controllo della turbina eolica

Modulo progettato per il controllo del gruppo motore della turbina eolica.
Permette il controllo manuale, tramite potenziometri sul pannello frontale, o da remoto, tramite porta RS485 utilizzando il protocollo Modbus.
Il pannello frontale include anche uno strumento digitale che visualizza i parametri del vento, della turbina eolica e i parametri meccanici.

Caratteristiche tecniche

- Comandi di ingresso: pulsante di emergenza, interruttore di abilitazione, interruttore di blocco a velocità zero, interruttore della modalità di controllo, interruttore di ripristino dell'allarme.
- Segnali analogici e con manopole: set point della velocità del motore, set point della coppia, velocità del vento, passo delle pale.
- Segnali di uscita: velocità dell'albero, coppia.
- Spie luminose: allarme, funzionamento, limitazione di coppia, limitazione di velocità, raggiungimento del set point di velocità/coppia.
- Porte RS485 (protocollo MODBUS RTU).
- Porta USB (per collegamento dell'anemometro)
- Interruttore di accensione.
- Morsetto di terra.

Wind turbine control module

Module designed for the control of the wind turbine motor group.
It allows the manual control, using the potentiometers on the front panel, or the remote control, via the RS485 port using the Modbus protocol.
The front panel also includes a digital meter that displays wind, wind turbine and mechanical parameters.

Technical features

- Input controls: emergency button, enable switch, zero sped clamp switch, control mode switch, alarm reset switch.
- Knob and analogue signals: motor speed setpoint, torque setpoint, wind speed, blade pitch.
- Output signals: shaft speed, torque.
- Indicator lights: alarm, ready (operation light), torque limiting, speed limiting, speed/torque setpoint reaching light.
- RS485 ports (MODBUS RTU protocol).
- USB port (for anemometer connection).
- Power on switch.
- Ground terminal.